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No. 729, dated the 3rd April 1902.

From—W. M. HAFFKINE, ESQ., C.I.E., *Director-in-Chief, Plague Research Laboratory, Bombay.*

To—*Sanitary Commissioner, United Provinces of Agra and Oudh.*

Sir,—I have the honour to confirm this office deferred telegram of 25th ultimo sent to you in reply to your wire of 23rd idem, and which ran as follows:—

"Yours of 10th instant. Cultures Nos. 16 and 18 received from Agra, 18th. Typical stalactites in broth and usual plague appearance on agar obtained twentieth and subsequent days. Rather large doses of agar and broth cultures of both numbers inoculated subcutaneously, intraperitoneally, (and) intravenously in rats, guineapigs, (and) rabbits on twenty-second. All succumbed yesterday 24th, showing bacilli in organs. Rats now being tried with minimal doses. No involution forms so far, but this feature not constant. Cultures may be pronounced plague."

2. I beg now to inform you that 24 hours agar-cultures were prepared from your specimens Nos. 16 and 18, and two rats infected by being scratched in the right thigh with a glass bristle brought in contact with each culture separately. Both animals succumbed, the first in five and the second in seven days, showing swollen glands in right inguinal region and plague bacilli in organs. Thus far the cultures do not differ from ordinary plague microbes.

A RECURRENCE OF EPIDEMIC DROPSY IN CALCUTTA IN 1901.

BY LEONARD ROGERS, M.D., M.R.C.P.,
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AT the beginning of June 1901 a slight outbreak of this rare but interesting disease occurred in Calcutta, which I was enabled, through the kindness of Lieutenant-Colonel R. L. Dutt in calling my attention to it, to see a few cases of. The disease, however, very soon after subsided, and there now appears to be little likelihood of my having an early opportunity of obtaining more material for investigation, so it may be worth while to briefly put on record the few facts observed.

This disease was first described as occurring in Calcutta in the latter part of the years 1877, 1878 and 1879, breaking out each time after the rainy season was over and dying down again in the following hot weather. After an interval it appeared again in 1881, this time during the the hot season. In addition to Calcutta a slight outbreak occurred in Dacca and a more extensive one in Shillong, while a large number of cases also appeared in Mauritius, all of these places having been apparently infected from Calcutta. A good summary of what is known of this disease will be found in a paper which was read by Professor Kenneth McLeod before the Epidemiological Society of London in January 1893, and published both in their proceedings and in the *Indian Medical Gazette* of 1893-94, and a shorter paper by the same author is included in Clifford Allbutt's System of Medicine. In order to allow of my cases being easily compared with those of the former outbreak, it will be well to mention the chief characters of the affection as described by Dr. McLeod. Dropsy, usually preceded by fever, is the essential symptom, affecting first the feet and legs, but ascending to the hips or waist and affecting the upper extremities, and occasionally also the face. It persists for long and may effect the pleura and pericardium, but very rarely the peritoneum. Remittent pyrexia, usually from 100 to 101, but sometimes reaching 104, without rigors or sweating, usually appears before or with the other symptoms. Diarrhœa and vomiting was first noticed in the Mauritius cases, but was also seen in about half the Calcutta ones, the stools being frequent and scanty. Burning or pricking of the skin or aching of the deep parts was noted, but there was no numbness of paralysis. The eruption was specially noticed in many of the Mauritius cases as a diffuse redness on the face, or as morbiliform or dark red cresentic patches, with sometimes petechiæ in bad cases, affecting the trunk and limbs. There was no albumen in the urine. In severe cases dysnœa, palpitation, congestion of the lungs, rapid pulse and lividity may ensue. The liver may become enlarged secondary to the heart symptoms. The spleen is not enlarged except when malarial complications are present. The lymphatic glands are normal. Anæmia is an essential symptom of the disease, the red corpuscles being decreased and the white increased according to Lovell of Mauritius, but T. R. Lewis found nothing special in the blood in Calcutta. The duration of the disease was two to three months, the average according to Lovell being six weeks. It may be suddenly fatal on the fifth or sixth day, the mortality in Calcutta having been given as from 8 to 40 per cent., and in Mauritius as from 2 to 3 per cent. The difference may possibly be due to some of the Calcutta observers only seeing the more severe cases.

The Recent Outbreak.—The recurrence of the disease in 1901 occurred during the hot weather, and appears to have been limited to a few households in the northern part of the town around Harrison Road and Cornwallis Street. Groups of cases in three houses in different streets were seen by me, while a few more were seen by the Health Officer of Calcutta at the Bethune College for Girls. The outbreak was thus a very limited one, and it appears to have subsided with the onset of the rainy season, and, as far as I can learn, did not recur during the last cold weather or during the recent hot season.

Household in Tanner's Lane.—Out of 17 persons in this house no less than 14 had been attacked by the disease at the time of my visit. Shortly before the first case occurred some excavation had been going on just outside the house, which may or may not have had anything to do with the outbreak. The family was a very well-to-do Hindu one, who were intimately connected with another household in a house which was continuous with that att cked, yet none of the second household got the disease, which points to a very localised infectiousness. The father, mother and one grown up son were first attacked simultaneously, the woman having diarrhœa and dropsy, but the other only diarrhœa with frequent scanty stools passed with some distress. Ten days later another woman, a maid servant and three children were attacked on the same day, and seven days later still the rest of the family

developed the disease. All those over 20 years of age suffered from diarrhœa, while the children had dropsy and fever. In two cases pain in the testicle with the fever was noted. The disease usually began with diarrhœa and pain all over the body, but swelling was absent in two and slight in another. One old man had much swelling which reached the abdomen, together with fever. All the children had slight œdema in the feet, and in one of them it extended up to the abdomen. All the children had slight fever, usually up to 100 in the evening and lower in the morning. All the female members of the family had fever, dropsy and rash except one old woman of 85, who had no rash, and they appear to have suffered more severely from the disease than the male members did.

Rash had occurred in nearly all the cases, being of the nature of dark pulple purpuric looking spots, which tended to run together to form irregular blotches, being most marked on the legs and arms, that is, on the parts affected by the dropsy. In only one case was it noticed on the face. There was slight yellowness of the conjunctiva in a few cases. There was no rigor at the commencement of the fever, and no sweating on its defervescence except in one man after a rise to 104·8 Sickness was not a marked feature of the disease except in two of the female patients, but several of the children also suffering from it slightly. Dyspnœa was only present in the severe cases with dropsy of the abdomen. The *urine* had only been examined in the case of the very old female patient, and a trace of albumen and very few hyaline casts were said to have been found. The *age* of those attacked varied from 6 to 85 years, and the only members of the household who escaped were a boy of 8 years, and two infants of one year and ten months of age respectively, a point of interest as McLeod also states that very young children escape the disease. At the time of my visit the disease was on the wane, but three of the boys showed temperatures of from 99·4 to 99·6. The above somewhat incomplete details were obtained by questioning the adult patients.

Household in Mudden Mitter Lane.—This outbreak occurred in the house of a native medical practitioner, which allowed of more complete and accurate notes of the histories and progress of the cases being obtained. The outbreak began four weeks before my visit, the first case being in a servant, after which three more servants were attacked, two of whom slept in a verandah with the first patient. The first case showed slight fever, chronic diarrhœa, followed by dropsy of the extremities. A week after the servants fell ill the wife and three children of the doctor, aged from 14 to 25, were attacked, while very shortly before my visit three more children, aged 10, 12 and 19 years respectively, developed the disease. The only members of the household which had escaped up to that time were the old doctor himself, a grandchild aged 3, and an infant, again illustrating the apparent immunity of very young children, while the doctor was beginning to suffer from loose motions on the day of my visit, which appeared to be the beginning of an attack. The following brief notes of these cases will give a fair idea of the disease:—

First Case in Servant.—He now shows œdema of the legs up to the knees, and some anæmia. He complains of some burning sensation and muscular pain, but there is no anæsthesia, and the knee jerks are present.

Son aged 25.—He first suffered from slight fever for a few days, followed by œdema, diarrhœa and rash. The œdema now reaches up to the knees, but at one time spread to the thighs, while there was also slight swelling of the nose and eyelids. He had pains all over the body and in the feet and legs and in the muscles. The rash affected the leg and arms, being first a roseola in nature and afterwards of a purplish colour. He passed three or four loose stools a day without pain. The knee jerks are normal and there is no anæsthesia. He is weak and slightly anæmic, the hæmoglobin being 65 per cent. The spleen and liver are normal.

Son aged 17.—He was attacked at about the same time as the last case, but no fever was noticed. The œdema affected the arms and the legs up to the thighs, and is still well marked in the legs, becoming less when he lies down. The rash came on after the swelling and in the dropsical parts. It now presents the character of purplish steaks in the course of the superficial veins, being most marked on the legs. He has been passing about two loose stools a day for the last three weeks, but has not suffered from sickness. The knee jerks are present, and there is no anæsthesia. The liver and spleen are normal. He is weak and slightly anæmic and has a soft pulmonary systolic hæmic murmur.

Son aged 14.—His illness began twenty days ago, just before that of the eldest boy, with swelling which reached up to the thighs and affected the arms but not the eyelids. It is still well marked in the legs. Fever was not noticed. The rash appeared after the dropsy and affected the swollen parts. It is now present on the legs in the form of purplish steaks in the course of the superficial veins as in the preceding case. Diarrhœa began about the same time as the rash, two or three loose stools a day being passed without pain. There was no sickness. The knee jerks are present, and there is no an anæsthesia. The spleen and liver are not enlarged. He is anæmic. The urine had a specific gravity of 1005 and was free from albumen.

The above cases had all been taken ill some time before I saw them, but the next three cases had only begun to show symptoms on the morning of my visit. Son aged 12 showed a suspicious faint rash on the legs similar to that described in the two preceding cases, but as yet showed no œdema or fever, his temperature at noon being normal. Another son aged 10 showed slight œdema just above the ankle and a slight rash, while a sixth son aged 19 showed similar slight œdema and rash, and his temperature at noon was 99·2.

This group of cases illustrates very well the main features of the disease, and, allowing for the mildness of the present outbreak, its identity with that of 1877-79 will be evident enough.

Household in Shibnarain Das' Lane.—In this instance again the first to be attacked was a servant, who was taken ill over a month before my visit, commencing with swelling of the feet followed by diarrhœa, many stools being passed for two or three days. Two or three days after this first case appeared five out of the six persons remaining in the house were attacked at the same time, the head of the household alone escaping, but his uncle, wife, and servants were all attacked. There were no children in this house.

The most severe and interesting case was his wife, who first suffered from fever, and two days later dropsy appeared. She was sick once after taking medicine, but had no diarrhœa, and no rash was noticed. The fever had lasted about one month, while the dropsy affected the legs and arms and was well marked over the abdominal wall. The fever was at first remittent in character, ranging from 102° to 104°, but now is intermittent, remains between 99° and 101°, and sometimes falls to normal in the morning. She suffered from headache and palpitation. The pulse was 120 per minute, and hæmic murmurs were present at both the apex and pulmonary areas, being most marked in the latter position. Anæmia was present, the red corpuscles numbering 3,090,000 per c. m. and the white 7,500, or one white to 312 red. The spleen was not enlarged, but there was slight tenderness over the hepatic area. The urine had been examined and reported as being scanty, of a dark red colour, sp. gr. 1020 with excess of urates, blood and hyaline castes and a trace of albumen.

The cook, a female, had suffered first from swelling of the feet with slight fever and diarrhœa, but no rash, and she still showed œdema of the feet. She was slightly anæmic. Hæmoglobin 55 per cent., red cor-

puscles 4,700,000, white 9,500, making one white to 494 red, or nearly double the normal proportion. Another female servant who was recovering from the disease showed slight anæmia, her hæmoglobin being 54 per cent.

Remarks.—It will be observed that most of these cases were very mild, but a few of the attacks, more especially among the women, were severe, although none were actually fatal, the total number being small. Yet every symptom described by McLeod was seen in the present outbreak, and I also agree with that writer that this disease is quite distinct from beri-beri. The presence of the knee jerks and the absence of anæsthesia alone appears to be sufficient to differentiate the two, while the rapidity with which the disease spreads through a household within a week or two together with the rash and bowel symptoms support this conclusion. Perhaps of even greater diagnostic importance are the differences in the blood changes in the two diseases, for in the epidemic dropsy anæmia is an essential symptom, while this is usually absent in cases of beri-beri, in a large proportion of cases of which the corpuscular richness of the blood is perfectly normal according to Manson, this having also been the case in a few cases of the disease which I have examined myself. On the other hand, anæmia is a constant symptom of all but the very mildest cases of epidemic dropsy, although not of an extreme degree as a rule, as is illustrated in the few cases narrated above in which I was able to examine the blood. In contrast to the decrease of both the hæmoglobin and the red corpuscles is the increase of the white, which numbered over 10,000 in two cases and over 9,500 in another, while in a fourth there were 7,500 against 3,090,000 red, showing a relative increase of the white. In the remaining case only 4,500 were found, but this was a mild one with very slight fever. These observations agree with those of Lovell in Mauritius, and illustrate once more the identity of the present and the former outbreaks.

Bacteriology.—As these cases were seen in private native houses, bacteriological examinations were attended with some difficulty, but I was able to make culture from fluid obtained by means of a hypodermic syringe from the œdematous parts in eight cases, and in one also from the blood of the median basilic vein, but with negative results, the highly resisting sporing bacillus mesentericus only being obtained in some cases, doubtless owing to contamination, the syringes having only been boiled in sterile water and not treated with heated oil, while the variety obtained was found to stand boiling for one minute. At this point further observations were stopped owing to the disease dying out.

Nevertheless the disease appears to be a specific one, for although at first sight the occurrence of so many cases in single houses might be thought to suggest some article of diet as a possible cause of the disease, yet when we come to study the sequence of the cases, and the way in which successive groups are attacked at varying intervals, then infection seems to be the only possible explanation of the incidence of the disease, and in this connection it is of interest to note that in two out of the three houses dealt with, a servant was the first victim of the disease, by whom it was probably introduced. All the facts here recorded, then, point to epidemic dropsy being a definite specific disease of unknown origin.

FURTHER EXPERIMENTS IN CONNECTION WITH THE PATHOLOGY OF BERI-BERI.

By E. R. ROST,
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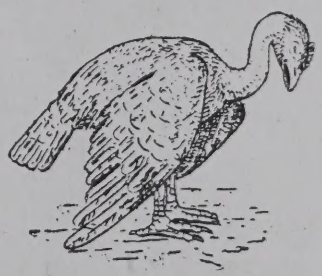
In the *Indian Medical Gazette* of July 1901 I mentioned that experiments had been carried out on fowls to show the connection between beri-beri in man and a disease in rice; I have now carried out a large number of experiments on fowls and latterly on pigeons, which are still more in support of my former contentions.

Fowls fed on fermenting rice obtained from Pegu jars in the rice-liquor shops of the town, develop a disease which is rapidly fatal.

Out of thirty fowls experimented upon in this direction not one recovered, although three, removed from the influence of the feeding, died shortly after.



Earlier stage, showing drooping wings, bare neck and stooping position.

Fowl dying from beri-beri sitting on its hocks, only feathers are on its wings and tail.

The symptoms were as follows:—The birds rapidly became anæmic, weak, listless and fell remarkably in weight, their feathers fell out,

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